a tube was too slight to be amenable to direct chemical test, but the change operated by the light could be clearly demonstrated by passing an electric discharge through two similar tubes, one of which had and the other had not been exposed to the radiant energy from a source of high potential. If space could be thought to be filled with such vapour, of which there was much evidence in proof, solar rotation would necessarily have the effect of drawing such vapour towards its polar surfaces, and emitting it equatorially by an action independent of solar gravity, and which might be likened to that of a blowing fan. When reaching the solar photosphere, this circulating dissociated vapour would, owing to its accumulated density, flash into flame, and could thus be made to account in great measure for the maintenance of solar radiation, whilst its continual dissociation in space would account for the continuance of solar radiation into space without producing any perceivable calorific effect.

Time did not permit him to enter more fully on these subjects, which formed part of a solar hypothesis which he had ventured lately to bring forward, his main object on this occasion having been to elucidate the point of cardinal importance to that hypothesis, that of the solar temperature.

The lecture was illustrated by several experiments, showing the methods by which the dependence of radiation upon temperature had been arrived at.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Mr. H. Marshall Ward, M.A., late Scholar of Christ's College, First Class in the Natural Sciences Tripos, 1879, Lecturer at Owens College, and Fellow of Victoria University, has been elected Fellow of Christ's College.

It is proposed to appoint a Curator of the new Archæological Museum at Cambridge at a stipend of 150*l.* a year. Valuable contributions towards developing the Museum in the direction of ethnology have been promised.

In a discussion on the proposed immediate appointment of a Professor of Physiology, it was mentioned that enlarged class-rooms and a lecture-room, which did not exist, would be needed. A hope was expressed that the Professorship of Pathology would be filled up as soon as there was a reasonable prospect of sufficient appliances in the form of laboratory, &c., being provided for the Professor.

MR. W. N. STOCKER, M.A., Fellow of Brasenose, has been appointed Professor of Physics at the Royal Indian Engineering College, Cooper's Hill. Mr. Stocker took a first-class in mathematics and also in natural science, and has been for the last eight years Demonstrator in the Clarendon Laboratory.

SCIENTIFIC SERIALS

Journal of the Russian Chemical and Physical Society, vol. xv. fasc. 1.—Researches on the naphtha of Caucasus, by MM. Beilstein and Kurbatoff. The naphtha from Bakou consists mostly of hydrocarbons of the C_nH_{2n} series, identical with the products of hydrogenisation of the aromatic series C_nH_{2n-6}. That of the Tzarskiye Kolodtsy has a different composition; it contains but little of the hydrocarbons of the C_nH_{2n} series, but chiefly those of the C_nH_{2n+2} types, with a mixture of those of the aromatic series C_nH_{2n-6}. This analysis explains why the petroleum derived from the Bakou naphtha, although having a greater density together with the same volatility, burns brighter than the American, as also the higher qualities of the oils received from this naphtha. Its hydrocarbons being all liquid it contains but little paraffin, and the greasing oils may be cooled to lower temperatures, without liberating paraffin.—On the use of hyposulphite of ammonium, instead of the sulphide of ammonium, in qualitative analysis, by A. Orlovsky.—On the hydrogenisation of turpentine and cymol, by P. Orloff.—Additions to the theory of the action of chloride of ammonium.—On the evaporation of liquids, by B. Sreznewsky, being the conclusion of a treatise which has appeared in several preceding numbers of the *Journal*. The conclusions arrived at are: the velocity of evaporation is not constant; the velocity of evaporation of drops depends upon their height, and increases as the height diminishes; at a height of an average size it is proportioned to the periphery of the basis.—An aërial calorimeter (a project of), by N. Hesehus.—Elementary demonstration of the pendulum formulæ, by V. Wolkoff.

Vol. xv. fasc. 2.—On the transformation of the primary radical of propyl into a secondary, being a continuation of the researches undertaken by MM. Kékulé and Schröter, on the transformation of bromide into isopropyl under the influence of alluminium bromide.—On the heat of dissolution of mixtures of salts, and on the principle of maximum work, by P. Chrustchoff.—Analysis of the mineral waters of Slavinsk, in the Government of Lublin, by M. Kondakoff. They may be considered as one of the best iron mineral waters, as they contain the least mixture of other mineral substance; that is, 0·19 to 0·22 parts of carbonate of iron out of 3·18 to 3·38 parts of other salts, against 0·37 to 4·36, contained in the water of Spa, or 0·45 to 6·14, and 0·24 to 5·45 in those of Altwasser and Reinerz.—On the chloride of pyrosulphuryle, by D. Konovaloff.—Analysis of sulphur concretions in the fireproof clay from Bakhmut, by M. Kondakoff.—On the structure of nitric compounds of the fatty series, by M. Kissel.—On the permutations of bases in solutions of their neutral salts, by Prof. Menshutkin (analysed elsewhere).—On the specific heat of several products of distillation of naphtha, by E. Kuhlin.—On a secondary product obtained during the preparation of allyldimethyl carbinol, by W. Dieff; it distilled at 165° to 185°, and its structure may be represented as $C_9H_{18}O$.—On the critical temperature of isomeric and homologous series, by A. Nadejdine. The supposition formerly made by the author as to the critical temperature increasing in the same proportion as the temperature of boiling is confirmed by experiments with a sufficient degree of accuracy; it would result that the functions which express the dependency of the critical temperature upon the molecular structure are the same as those expressing the same dependency of the temperature of boiling, and differ only by their constants.—On comets and solar radiation, by M. Schwedoff.—Several conclusions from the theorem of Carnot, by M. Sreznewsky, being a confirmation of the formula of Kirchhoff ("Ueber einen Satz der mechanischen Wärmetheorie") for the expression of the absorption of heat during the formation of saturated solutions, and a verification of it for a certain number of salts.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 8.—"Note on the Reversal of Hydrogen Lines; and on the Outburst of Hydrogen Lines when Water is dropped into the Arc." By Professors Liveing and Dewar.

The concentration of the radiation of hydrogen in a small number of spectral lines would lead us to expect that the absorption of light of the same refrangibility as those lines would, at the temperature of incandescence, be correspondingly strong, and that therefore the hydrogen lines would be easily reversed. The mass of hydrogen which can be raised to a temperature high enough to show the lines is, however, so small that, notwithstanding the great absorptive power of hydrogen for the rays which it emits, the reversal of the lines has not hitherto been noticed. In fact, the lines are very readily reversed, and the reversal may be easily observed.

When a short induction-spark is taken between electrodes of aluminium or magnesium in hydrogen at atmospheric pressure, a large Leyden jar being connected with the secondary wire of the coil, the hydrogen lines show no reversal; but if the pressure of the hydrogen be increased by half an atmosphere or even less,[1] the lines expand and a fine dark line may be seen in the middle of the F line. As the pressure is increased, this dark line becomes stronger, so that at two atmospheres it is very decided. As the F line expands with increase of pressure, the dark line expands too, and becomes a band. It is best seen when the pressure is between two and three atmospheres. When the pressure is further increased, the dark band becomes diffuse, and at five atmospheres cannot be distinctly traced. No definite reversal of the C line was observed under these circumstances. The dispersion used, however, was only that of one prism.

By using a higher dispersion the reversal of both the C and F lines may be observed at lower pressures. For this purpose a Plücker tube was used, filled with hydrogen and only exhausted until the spark would pass readily when a large jar was used.

The light of the narrow part of the tube is, under these cir-

[1] The metallic gauge connected with the Cailletet pump used is not at all sensitive, so the pressures here mentioned are only approximate.

cumstances, very brilliant, while the spark in the broad ends is wider and less bright, but does not fill the tube. On viewing such a tube end on, and projecting the image of the narrow part of the tube on to the slit of the spectroscope, a continuous spectrum of the width of the image of the narrow part of the tube is seen, besides the lines of hydrogen given by the discharge in the wide part of the tube. These lines extend above and below the narrow continuous spectrum if the electrode is well placed so that half an inch or so of the spark in the wide part of the tube may intervene between the narrow part of the tube and the spectroscope. The continuous spectrum of the narrow part of the tube seems due chiefly to the expansion of the hydrogen lines when the discharge occurs in so confined a space, and it is much brighter than the lines given by the spark in the wide part of the tube. Where the latter cross the continuous spectrum a very evident absorption occurs. The authors observed it with a diffraction grating. The C line in the third order falls so near the F line in the fourth that both may be observed together. F is much more expanded than C, and the reversal consequently less marked though quite plain. The other lines being still more diffuse, their absorption could not be traced.

The authors have before observed (*Proc. Roy. Soc.* vol. xxx. p. 157) that the C and F lines of hydrogen are visible in the arc of a De Meritens' magneto-electric machine taken in hydrogen; though in the arc of a Siemens' machine the C line can only be detected at the instant of breaking the arc, the F line hardly at all. When, instead of taking the arc in hydrogen, small drops of water are allowed to fall from a fine pipette into the arc taken in air in a lime crucible, each drop as it falls into the arc produces an explosive outburst of the hydrogen lines. Generally the outburst is only momentary, but occasionally a sort of flickering arc is maintained for a second or two and the hydrogen line C is visible all the time. The lines (C and F) are usually much expanded, but are frequently very unequally wide in different parts of the line. F is weaker, more diffuse, and more difficult to see than C, and is visible for a shorter time. There is no sign of reversal. In the explosive character of the outburst and the irregularity in the width of the lines the effect resembles that of an outburst of hydrogen in the solar atmosphere. The elements of the water are, it must be supposed, separated, but from the explosive character of the effect they are not uniformly distributed in the arc. The arc being horizontal, and the image of it projected on to the slit of the spectroscope, it was really a very small section of the arc which was under observation, and this renders the variation in the width of the lines the more remarkable.

April 5.—"On a hitherto unobserved Resemblance between Carbonic Acid and Bisulphide of Carbon." By John Tyndall, F.R.S.

Chemists are ever on the alert to notice analogies and resemblances in the atomic structure of different bodies. They long ago indicated points of resemblance between bisulphide of carbon and carbonic acid. In the case of the latter we have one atom of carbon united to two of oxygen, in the case of the former one atom of carbon united to two of sulphur. Attempts have been made to push the analogy still further by the discovery of a compound of carbon and sulphur analogous to carbonic oxide, but hitherto, I believe, without success. I have now to note a resemblance of some interest to the physicist, and of a more subtle character than any hitherto observed.

When, by means of an electric current, a metal is volatilised and subjected to spectrum analysis, the "reversal" of the bright band of the incandescent vapour is commonly observed. This is known to be due to the absorption of the rays emitted by the hot vapour in the partially cooled envelope of its own substance which surrounds it. The effect is the same in kind as the absorption by cold carbonic acid of the heat emitted by a carbonic oxide flame. For most sources of radiation carbonic acid is one of the most transparent of gases; for the radiation from the hot carbonic acid produced in the carbonic oxide flame, it is the most opaque of all.

Again, for all ordinary sources of radiant heat, bisulphide of carbon, both in the liquid and vapourous form, is one of the most diathermanous bodies known. I thought it worth while to try whether a body reputed to be analagous to carbonic acid, and, like it, so pervious to most kinds of heat, would show any change of deportment when presented to the radiation from hot carbonic acid. Does the analogy between the two substances extend to the vibrating periods of their atoms? If it does, then the bisulphide, like the carbonic acid, will abandon its usually transparent character, and play the part of an opaque body, when presented to the radiation from the carbonic oxide flame. This proves to be the case. Of the radiation from hydrogen, a thin layer of bisulphide transmits 90 per cent., absorbing only 10. For the radiation from carbonic acid, the same layer of bisulphide transmits only 25 per cent., 75 per cent. being absorbed. For this source of rays, indeed, the bisulphide transcends, as an absorbent, many substances which, for all other sources, far transcend *it*.[1]

Chemical Society, April 19.—Dr. W. H. Perkin, president, in the chair.—The following gentlemen were elected Fellows: T. L. Briggs, J. A. Basker, J. B. Coleman, W. H. Cannon, E. C. Conrad, C. Gillett, E. C. Henning, N. K. Humphreys, L. Levy, A. Ness, V. I. Schopoff, A. E. Wilson.—The following papers were read:—On the gases evolved during the conversion of grass into hay, by P. F. Frankland and F. Jordan. The authors find that comparatively dry grass soon evolves considerable quantities of carbonic anhydride with mere traces of hydrogen and hydrocarbons; this evolution of gas occurs in air and in an atmosphere of carbonic anhydride or hydrogen: in oxygen a notable proportion of nitrogen accompanies the carbonic anhydride. Under water, grass also evolves carbonic anhydride with some hydrogen, due probably to lactic fermentation, acetic, lactic, and propionic acids being simultaneously formed.—Note on an apparatus for fractional distillation under reduced pressures, by L. T. Thorne. The object of this apparatus is to facilitate the removal of the various fractions of the distillation without breaking the continuity of the distillation.—Notes on the condition in which carbon exists in steel, by Sir F. A. Abel, C.B., and W. H. Deering. Two series of experiments are given by the authors; in the first the differences between cold rolled, annealed, and hardened samples of the same steel are investigated. The steel disks were subjected to the action of a saturated solution of potassium bichromate containing 5 per cent. by volume of sulphuric acid. In each case a blackish residue consisting of a carbide of iron was left; in the case of the cold rolled and annealed disks, the carbon in this residue corresponded pretty closely with the total carbon present; but in the hardened disk only one-sixth of the total carbon was found in this residue. In the second series of experiments, the action of various strengths of bichromate solution on cold rolled steel is studied, and it is proved that, if the oxidising solution be not too strong, a residue consisting of a definite carbide Fe_3C is left, and that the carbon is therefore not simply diffused through the mass, but exists as a definite compound capable of resisting the action of a solvent which rapidly dissolves metallic iron.—On the spectrum of beryllium with observations relative to the position of that metal among the elements, by W. N. Hartley. From a photographic study of the spectrum, the author concludes that beryllium is the first member of a dyad series of elements of which in all probability calcium, strontium, and barium are homologues.

Linnean Society, April 19.—Sir John Lubbock, Bart., president, in the chair.—Messrs. T. W. Coffin, F. H. Collins, C. D. F. De Laune, D. Morris, J. Jardine Murray, and Hon. J. B. Thurston were elected Fellows of the Society.—Mr. J. Britten exhibited and made remarks on specimens of *Arum italicum* from Torquay, South Devon.—Mr. G. F. Angas showed several vegetable products from the Island of Dominica, among others an unusually large seed-pod of *Cassia fistula*, and other examples of Leguminosæ, also Polyporus fungi from the Roseau Falls.—Mr. F. V. Dickins called attention to a Japanese work issued by the University of Tokio, giving descriptions and illustrations of plants grown in the Botanic Gardens of Koiskikawa.—A paper was read by Sir John Lubbock on the sense of colour amongst some of the lower animals (vol. xxvii. p. 619).—There followed a communication by Prof. P. T. Cleve of Upsala, on the diatoms collected during the Arctic expedition of Sir George Nares.—The Rev. A. E. Eaton gave a digest of an extensive monograph of the Ephemeridæ or Mayflies, part i. In this the subject is prefaced by an historical account and general view of the group; the genera are defined, and a

[1] Nearly twenty years ago I observed, among other changes of diathermic position, the reversal of bisulphide of carbon and chloroform, when the pale blue flame of a Bunsen burner was the source of heat. When, for example, the rays issued from a luminous jet of gas, the absorptions of the bisulphide and of chloroform were found to be 9·8 and 12 per cent. respectively; whereas when the Bunsen flame was employed, the absorptions of the same two substances were 11·1 and 6·2 per cent. The cause of this reversal doubtless is that in the Bunsen flame hot carbonic acid is the principal radiant (*Phil. Trans.*, 1864, p. 352).—April 6.

tabular conspectus of the present known species indicated.—A paper was read on the joint and separate work of the authors of Bentham and Hooker's "Genera Plantarum," by George Bentham.

Zoological Society, April 17.—Prof. W. H. Flower, LL.D., F.R.S., president, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of March, and called special attention to three Sirens (*Siren lacertina*) from South Carolina, presented by Dr. G. E. Manigault, C.M.Z.S., and to an American Teetee Monkey of the genus *Callithrix*, which it was difficult to determine satisfactorily in its living state, but which was certainly new to the Society's Collection.—Prof. Flower, F.R.S., gave an exposition of the systematic classification of the Mammalia which he had recently prepared for use in arranging the specimens in the Museum of the College of Surgeons, and in a treatise on the subject of Mammals in the "Encyclopædia Britannica."—A communication was read from Mr. W. L. Distant, containing the first of a series of contributions to an intended monograph of the Homopterous family Cicadidæ. In the present paper the author gave the results of an examination of the Cicadidæ contained in the Dresden Museum (including the specimens collected in Celebes by Dr. A. B. Meyer), and added the descriptions of other species belonging to the collections of Dr. Signoret and the author. Eleven species were described as new from various localities.—Mr. Sclater read a second paper on the birds collected in the Timor Laut or Tenimber group of islands by Mr. H. O. Forbes, based on additional specimens lately received. The avifauna of the group, as indicated by Mr. Forbes's collection, contained 59 species, of which 22 were peculiar to these islands.—A communication was read from Mr. F. Moore, F.Z.S., containing the first part of a monograph of the butterflies belonging to the groups *Limnaina* and *Euplœina*.

Physical Society, April 14.—Prof. G. Carey Foster in the chair.—New Members: Mr. W. F. Smith, Mr. George Forbes, M.A.—Mr. W. Lant Carpenter read a paper on science demonstration in Board schools, in which he showed the drawbacks of the present system of leaving science to be taught by the other masters, and pointed out the marked advantages of the system followed in Birmingham and Liverpool, where skilled lecturers are appointed to go from school to school, and provided with an assistant demonstrator and proper apparatus. Mr. Carpenter advocated the extension of this system to London and the country in general. He also showed the evil of the present system of cramming for examinations. Dr. W. Carpenter pointed out the advantages of object lessons in training the minds of children. Dr. J. H. Gladstone stated that much had been done in London to introduce object lessons, and that under the Mundella code science would be taught in all Board schools to all the children, who, however, might have the opportunity of choosing between science and literature. Mr. W. Baily, Prof. Foster, and Prof. W. Chandler Roberts, also advocated the system of special science teachers.—Prof. Roberts then took the chair, and Mr. Glazebrook explained a new polarising prism which he had devised to prevent displacement of the pencil of rays. He also showed how the curved diffraction-gratings of Prof. Rowland do not always give perfect definition, and calculated the aberration of the rays.—The Secretary then read a paper by Mr. W. H. Stokes and Mr. A. E. Wilson on experiments on the viscosity of saponine. When a disk is rotated in water, the resistance to its motion is greatest when the plate is immersed a little below the surface; but with saponine the viscosity is greatest when the disk is not wholly, but only partially, immersed below the surface.

Entomological Society, April 4.—Mr. J. W. Dunning, M.A., F.L.S., &c., president, in the chair.—The death of Prof. P. C. Zeller of Stettin, one of the Honorary Members of the Society, was announced and commented upon.—Two new Members were elected.—Mr. W. F. Kirby exhibited specimens of *Acridium succinctum*, Linn., one of the most destructive species of migratory locusts in India.—Prof. Westwood mentioned that a Myriopod, *Polydesmus complanatus*, Linn., had lately been erroneously announced to be the cause of the potato disease.—Rev. A. E. Eaton exhibited a patent revolving object-holder used by mineralogists, which seemed likely to be useful to entomologists also.—Mr. E. A. Fitch exhibited galls of *Cecidomyia violæ*, Loew., and of *Aploneura lentisci*, Licht.—Sir S. S. Saunders read a short paper on the classification of the germ-feeding races of fig-insects.—Mr. H. Goss exhibited specimens of *Pimelia angulata*, Fabr., from the temple of the Sphinx at Ghizeh.—Papers read:—On a small collection of Clavicorn *Coleoptera* from North Borneo, by Mr. A. S. Olliff; Descriptions of new genera and species of *Hymenoptera*, by Mr. P. Cameron; and notes on new or little-known species of *Hymenoptera*, chiefly from New Zealand, by Mr. W. F. Kirby.

EDINBURGH

Royal Society, April 16.—Mr. Murray in the chair.—Mr. Sang read a paper on some properties of the curve of simple flexure, of which he gave neat geometrical demonstrations. A simple construction was given for finding the radius of curvature at any point and so affording a ready means for tracing the curve. The related theorems in pendulum motion were also given.—Dr. Knott communicated the results of electrometer measurements of the resistance of electrolytes, which had been carried out lately in the Edinburgh University Laboratory. The method seemed capable of giving fairly accurate values.—In a note on the electrical resistance of hydrogenised palladium, Dr. Knott gave 1·51 as the ratio of the resistances of the fully-charged and pure palladium, the increase of resistance being very nearly proportional to the charge for smaller charges. It was also noted that the electromotive force between palladium and platinum dipping in dilute sulphuric acid was greatly increased for a slight charge of hydrogen, falling off again very markedly as the charge reached its maximum.—Dr. Macfarlane, in a note on plane algebra, or double algebra, as De Morgan named it, demonstrated with facility certain theorems that ordinarily require considerable algebraic manipulation.—Prof. Tait presented a continuation of his theoretical investigations on heat conduction in heterogeneous bodies, as modified by the Peltier and Thomson effects, and gave the result of his investigation of the thermo-electric position of pure ruthenium. On the diagram this metal lies below iridium, to which it is in other thermoelectric respects very similar.

BERLIN

Physical Society, April 6.—Dr. Aron reported on the accumulators, on which he has been making experiments for several years past. Even before M. Faure's discovery, at the time when M. Planté announced his first essays with the secondary batteries, Dr. Aron was endeavouring to determine a convertible electric element which, being theoretically possible, might also be available for practical purposes. He first of all tried to make the Daniell chain convertible by using, instead of the two amalgamating fluids, hydrate of soda and sulphate of copper which do not amalgamate, but without success. Like many others he repeatedly tested Planté's already published statements regarding convertible cells of plates of lead immersed in diluted sulphuric acid, and which had to be charged in a very definitely prescribed way, but without any certain results. The cell sometimes became charged and discharged alternately, at other times not. He accordingly tried plates of lead which had been previously crystallised by corrosion, and these he found far more reliable. He therefore constructed accumulators of plates of lead in sulphuric acid to which some nitric acid had been added. Although more certain in their application, these were by no means equal to the practical requirements. The favourable results of the corrosion, as regarded the crystalline surface, a point also confirmed by Planté himself, was explained by Dr. Aron, who attributed it to the disintegration of the metal. He therefore tried to increase the effect by using lead-sponge, but without result. At that time he also thought of red lead, but made no experiments with it, because he knew of no means of fixing this powder to the lead plate conductor. It is now known that M. Faure simply spread the red lead on the plates, and thus produced his powerful accumulators possessing great storage capacity. When this became known, Dr. Aron carried out an extensive series of similar experiments in order to test its practical value, and even increase it. For the latter purpose he introduced a substantial improvement by attaching the red lead with collodium, which in the practical application of the chains is of course out of the question. But as regards their practical utility the accumulators have fallen far short of the hopes generally entertained of them. The main difficulty lies in the thin plates of lead which, when thickly covered with red lead, although very effective, become corroded and useless after being once used, while thick plates, by the formation of sulphate of lead, are rendered ineffective. As to the theory of accumulators, to rightly understand it, it is very important to bear in mind the

fact established by Messrs. Gladstone and Tribe, that in the cell, consisting of two plates in diluted sulphuric acid, the electric current changes the sulphate of lead generated at the positive pole into peroxide of lead, $PbSO_4 + H_2O + O = PbO_2 + H_2SO_4$, whereas at the negative pole the sulphate of lead is simply decomposed into sulphuric acid and disintegrated lead. Hence, after charging, the cell consists of Pb | H_2SO_4 | PbO_2 | Pb, a combination which yields a very powerful discharge, available al o for a protracted period. To this theory it has been objected that at the negative pole the sulphate of lead cannot be decomposed into lead and sulphuric acid. But Dr. Aron has satisfied himself that, under the influence of the hydrogen beginning to be generated, very thin layers of sulphate of lead become so reduced, thicker layers alone resisting decomposition. The process at the positive electrode being really such as is described by Gladstone and Tribe, the above theory of accumulators may, broadly speaking, be accepted as correct. As regards the peroxide of lead, the speaker pointed out that this combination is admittedly of a brown colour, whereas the substance deposited on the positive plate is black. From a more searching examination of this substance, it resulted that it is not the peroxide, but a hydrate of the peroxide of lead. And Dr. Aron suspects that there is here less question of a hydrate PbO_2H_2O than of a combination of the oxide of lead with peroxide of hydrogen. A series of theoretically interesting isolated phenomena may possibly be produced by following up the processes here in question. But in the present conditions Dr. Aron holds the practical application of the accumulators to be hopeless.—Prof. Neesen briefly described a slight improvement in the quicksilver air-pump, illustrating it with a diagram.

PARIS

Academy of Sciences, April 23.—M. Blanchard in the chair.—The death of Prof. Roche of Montpellier, Correspondent in Astronomy, was announced. (A report on his work by M. Tisserand is inserted in *Comptes Rendus*.)—A new method for determination of the right ascension of polar stars, and of the inclination of the axis of a meridian above the equator (continued), by M. Lœwy.—On some relations between the temperatures of combustion, the specific heats, the dissociation, and the pressure of explosive mixtures, by M. Berthelot.—Note on the inland African sea, by M. Cosson.—On a manner of determining the angle of position of a point of the surface of a star with the aid of a horizontal telescope, by M. Trépied.—On the use of the horizontal telescope for observations of solar spectroscopy, by M. Thollon. His apparatus is essentially a horizontal telescope deprived of the tube and reduced to its most simple expression. It is more easily managed than an equatorial. The mirror used is guided by the two hands, and the solar surface is explored at will. The author shows how he solved the difficult problem of determining position.—Determination of a particular class of surfaces with plane lines of curvature in a system, and isotherms, by M. Darboux.—On the reduction of ternary positive quadratic forms, by M. Minkowski.—Law of periods (concluded), by M. de Jonquières.—On a relation of involution, concerning a plane figure formed of two algebraic curves, one of which has a multiple point of an order of multiplicity inferior by unity to its degree, by M. Fouret.—Study of infra-red radiations by means of phenomena of phosphorescence, by M. Becquerel. He indicates the results of his method with telluric bands, the absorption spectrum of water and of some earthy metals, and the emission spectrum of metallic vapours.—On the specific heat of some gases at high temperatures, by M. Vieille. He verifies, for the gases H, O, N, and CO, the identity of the molecular heats with constant volume up to 2700°. The measurement of pressures leads him to attribute to certain reactions temperatures much higher than have been supposed practically realisable.—On the variation of indices of refraction of water and quartz under the influence of temperature, by M. Dufet. He indicates a new application of Talbot's fringes in measurement of this variation. The number for quartz is almost identical with that obtained by M. Fizeau.—Experimental studies on the production of vowels in whispered speech, by M. Lefort. Air is blown into a cavity of variable capacity, open and closable at the upper part. The sounds characteristic of vowels are thus produced. The author claims to prove that the vowels are not timbres (as generally taught); they are notes of different heights of the instrument of speech (quite distinct from the vocal instrument). Various timbres may be communicated to them by action of the muscles of the organ of voice.—On the liquefaction of nitrogen, by MM. Wroblewski and Olszewski. Nitrogen cooled in a glass tube to −136° C., and under a pressure of 150 atm., does not liquefy. On sudden release there is tumultuous ebullition. Gradual release, not passing 50 atm., yields the liquid, clear and colourless, with a distinct meniscus; it evaporates very quickly. The liquefaction of CO under like conditions on April 21 was announced.—On iodised apatites, by M. Ditte.—Action of water on Theil's lime, and the existence of a new hydraulic compound, *pouzzo-portland*, by M. Landrin. The composition of this compound is silica 44·55, lime 55·45. It is the principal element of all Theil's compounds.—On some phenolic derivatives, by M. Henry.—Jurassic Echinida of Algeria, by M. Cotteau. Of the 47 species found, 28 occur in Europe about the same stratigraphic levels. Some curious species peculiar to Algeria are noted.—Clayballs of Macaluba, by M. Contejean. These were found (of all sizes from a cannon-ball to a boy's marble) in the dried bed of a ravine, near the mud volcano named. They are of coarse clay, with small crystals of gypsum, giving a rough surface. It is thought they are formed by the autumn rains, and are dissolved by the heavier winter rains.—The perception of white and of complex colours, by M. Charpentier. His curves show, *inter alia*, that what artists term warm colours are distinguished from a colourless ground *more* easily than white, the cold colours *less* easily.—On the functions of pyloric appendices, by M. R. Blanchard. These appendices digest effectively cooked starch, less effectively raw starch, and transform albuminoids; as they do not effect emulsion and decomposition of fats, they are but imperfect representatives of the pancreas.—On the bite of the leech, by M. Carlet. He detached the animal from the shaved skin of a rabbit at different stages. Suppose a scarifier, with three toothed and equidistant blades withdrawing from one another while they press into the skin, and operating several times successively in the same place: this gives a pretty exact idea of the mechanism.—Comparative study of the bacteria of leprosy and of tuberculosis, by M. Baber. The differential properties indicated by Koch do not, he holds, exist; but there are others, bearing on chemical and molecular reaction, on form, and on arrangement in the tissues.—Influence of sensitive (nerve) roots on the excitability of motor-roots, by M. Canellis. Section of the sensitive root increases considerably the excitability of the motor nerve.—Immunity of workers in copper during the last epidemic of typhoid fever; confirmation of anterior observations, by M. Burq.—Influence of altitudes on phenomena of vegetation, by M. Angot. The harvest-time for winter wheat is retarded in France on an average four days where the altitude is increased about 100 metres.

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